ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF WATER
PROGRAM GUIDANCE

IMPLEMENTATION GUIDANCE: 2005 PROPOSED MIXING ZONE REGULATIONS

DRAFT

Purpose: This guidance to Department wastewater discharge staff reflects revisions to regulations for mixing zones in 18 AAC 70.240 adopted on [DATE]

Adverse effects: When determining whether to authorize a mixing zone, the department will consider, among other requirements, any proposed measures to mitigate adverse effects to aquatic resources present (18 AAC 70.240(b)(4). Any mitigation measures, along with other mixing zone controls, must maintain and protect the growth and propagation use in the waterbody affected by the mixing zone.

Consideration of the adverse effects of a pollutant will include any available evidence of sublethal chronic effects and the potential of the pollutant to persist or bioaccumulate (18 AAC 70.240(d)(1)). For the purposes of this evaluation, the following guidelines will be used:

- Bioaccumulative pollutants are any chemical that has the potential to cause adverse effects which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor greater than 1000, after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation.

- Persistent pollutants are any chemical which is slow to or does not decay, degrade, transform, volatilize, hydrolyze or photolyze and with a half life greater than two months in the water column, sediment, and biota.

Human health: 18 AAC 70.240(d)(2) prohibits mixing zones that would present an unacceptable risk to human health. To determine health risk, the Department may require an applicant to perform a site-specific analysis based on exposure pathways, including exposure duration of affected aquatic organisms in the proposed mixing zone, patterns of fisheries use, and consumption of water, fish, or shellfish in the area. The risk assessment method should follow guidelines found in *Technical Support Document for Water Quality-Based Toxics Control.* 1991. EPA/505/2-90-001.

For carcinogens, an acceptable risk is based on a lifetime incremental cancer risk level of 1 in 100,000 for exposed individuals under 18 AAC 70.025. For non carcinogens, an acceptable risk is based on the reference dose (RfD) obtained from the EPA's Integrated Risk Information System (IRIS) or other DEC-approved toxicological data source. The RfD is an estimate of the daily exposure to the human population that is likely to be without appreciable risk of causing deleterious effects during a lifetime.

Computer models:

Mixing Zone models are tools used to predict how substances mix upon discharge to a receiving water. Department staff primarily use two mixing zone models, CORMIX and PLUMES, however other models, if approved by the department, may be used to determine mixing zone characteristics. The CORMIX and PLUMES models are most accurate for near field dilution determinations, but are also capable of providing estimates of farfield dilution. Both CORMIX and PLUMES provide graphic representation of the plume size and associated dilutions. When using the models for far field determinations, modeling results may not be reliable when a plume reaches a boundary such as a river bank.

Initial mixing/acute zone:

Compliance with 18 AAC 70.240(d)(8) of the Water Quality regulations is assumed if **one** of the following methods is used to limit the size of the zone in which acute aquatic life criteria are exceeded:

1. The initial discharge velocity is 3 m/s or greater; and the mixing zone is no larger in any direction than 50 times the discharge length scale (i.e. the square-root of the cross-sectional area of the largest port).
2. Acute aquatic life criteria are met within a distance from the outfall that is no greater than
   - 10% of the distance to the boundary of the mixing zone;
   - 50 times the discharge length scale; and
   - 5 times the local water depth.
3. A drifting organism reaches the acute mixing zone boundary (i.e. the zone in which aquatic life criteria are exceeded) in 15 minutes or less.
4. A drifting organism does not receive harmful exposure when evaluated by a valid toxicological analysis approved by the department.

For additional information on how these methods are implemented see *Technical Support Document for Water Quality-Based Toxics Control.* 1991. EPA/505/2-90-001.

Flow calculations for streams and rivers:

Low flows should be calculated using methods of

- Ashton and Carlson, *Determination of Seasonal, Frequency and Durational Aspects of Streamflow with Regard to Fish Passage Through Roadway Drainage Structures* (1984);
- Carlson, *Seasonal, Frequency and Durational Aspects of Streamflow in Southeast and Coastal Alaska* (1987); or
- Other appropriate regional regression flow model approved by the

department.

Actual flow data collected concurrent with the discharge may also be used to monitor compliance with water quality standards under 18 AAC 240(h)(1). For the purposes of data collection under this section, "concurrent" will be a set time period approved by the Department based on the variability of the specific site conditions. Historic river and effluent flow will initially be used to design a mixing zone with sufficient dilution capacity during critical low-flow periods as designated in 18 AAC 240(h)(2). Concurrent flow data may then be used to monitor compliance with the approved mixing zone boundaries using either of the following two methods:

1. Pollutant concentration levels may be calculated for the mixed effluent and river water at the edge of the mixing zone using concurrent river and effluent data. The calculated concentration must meet water quality standards. Effluent flow and/or quality may be varied at the time of discharge depending on the concurrent river flow volume available for dilution.

   The data necessary for this calculation includes the following:
   - For conventional pollutants, the volume of effluent discharged daily should be determined. For toxic pollutants, the maximum 2-3 hour flow during a daily discharge cycle should be determined.
   - The effluent should also be sampled for each pollutant to which concurrent flow limits apply. Samples should be taken concurrent with the flow data.
   - The volume of river water available for dilution purposes should be measured concurrent with flow data for the discharge.
   - Either historic data, if sufficient, or concurrent monitoring of the background river water concentration of a pollutant may be used for dilution determinations.
   - Other water quality parameters, such as hardness and pH, may also be necessary to determine compliance with water quality standards.

2. Pollutant concentration levels may be measured by sampling at the downstream edge of a mixing zone to demonstrate compliance with water quality standards. Concurrent in-stream monitoring of flow, pollutants and other relevant water quality parameters should be collected as necessary. To minimize the amount of concurrent data to be collected and analyzed, concurrent limit determinations may be necessary only during low flow periods, with steady-state conditions applying at less critical, high flow periods.

Water rights for mixing zones: It is a good business practice for a permittee to ensure that other water users do not impact their ability to continue to discharge. DEC permitting staff will advise mixing zone applicants that they should contact DNR to obtain water rights. Water rights are not required to obtain a discharge permit, but they are strongly recommended since sufficient water must be available to comply with the mixing

zone permit conditions.

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Date